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European Patent Office  
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(11) Publication number:

0 033 286

A2

(12)

## EUROPEAN PATENT APPLICATION

(21) Application number: 81400126.9

(51) Int. Cl.<sup>3</sup>: H 01 R 13/645

(22) Date of filing: 28.01.81

(30) Priority: 28.01.80 US 116060

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(43) Date of publication of application:  
05.08.81 Bulletin 81/31

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(84) Designated Contracting States:  
DE FR GB IT

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(54) Polarizing means for mateable units such as electrical connectors.

(57) Releasably removable and adjustable polarizing means (30) for mateable assemblies (10,20) and comprising a keyway (72) disposed in one assembly and a polarizing pin (40) mounted in a slotted bore disposed in the other assembly, the pin having a round base (42) and a polarizing key (52) extending axially from the base, the base being provided with a plurality of longitudinally disposed projections (50) extending radially therefrom. A transverse cross-section of the slotted bore is somewhat smaller than the transverse cross-section of the base so as to provide a tight interference fitment therebetween. Another embodiment includes the one assembly having a like slotted bore and provides a multisided insert (60) having the keyway disposed therein, the insert and base being interchangeably fitable within the slotted bore of either assembly (10,20).

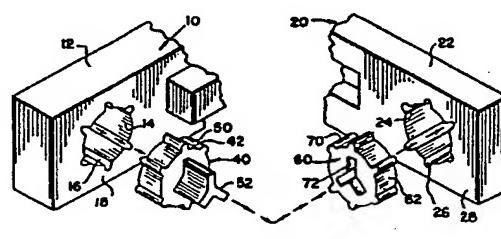


FIG.6

EP 0 033 286 A2

POLARIZING MEANS FOR MATEABLE UNITS SUCH AS ELECTRICAL CONNECTORS

This invention relates to polarizing means for controlling matability between the main parts of separable electrical connectors having confrontable bores, and more specifically relates to removable members provided with portions adapted to register with.

5 Separable electrical connectors are employed in computer and control installations where receptacle connector parts are mounted on a panel adjacent to each other and the mating connector parts are connected to respective cables. Means for correctly mating connector parts are shown in U.S. Pat. Nos. 3, 582,867; 3,611,272; 10 3,714,617 and 4,032,213. The first two patents show a polarizing member having a base portion retained in a connector bore in a press-fit by ribs. The latter patents disclose polarizing members which either require installation tools or require multiple pieces. Although the previous polarizing means are suitable for the purposes intended in 15 the applications described therein, it would be desirable to provide a connector polarizing apparatus which provides simple means for guiding the connectors in mating, is inexpensive, is readily positionable, requires few parts, is rapidly removable from and adjustable in a respective plug and/or receptacle assembly to control mateability of 20 the units and which eliminates the need for installation tools by the user in the field.

It would also be desirable to provide ribs which register and retain the base portion in an interference fit.

25 Unless the connector parts are correctly mated, malfunctioning or severe electrical damage to the apparatus may result. Provision of polarizing means would prevent incorrect mating between the parts of the connector to occur.

To this purpose, the invention proposes polarizing means 30 for mateable units such as electrical connectors of the type having first and second engageable assemblies carrying mateable electrical contacts comprising a round bore disposed in the first assembly the a polarizing key removably mounted in the first assembly and a keyway disposed in the second assembly, the key and the keyway having opposite ends with one end of the key being interfitable 35 within the keyway when properly oriented and in confronting relation on a common axis, an adjustable multi-sided base having

top and bottom portions and a generally symmetrical transverse cross-section, said base extending from the other end of the key and adapted to be mounted in the first assembly bore characterized in that the polarizing means further comprises a plurality of projections extending outwardly from the sides of the base, each projection being longitudinally disposed between the top and bottom portions of and spaced from each other around the sides of the base, said bore in the first assembly including a plurality of slots extending outwardly therefrom and defining registrable positions for receiving the projections, a transverse cross-section of the bore and its slot corresponding to but being somewhat smaller than the transverse cross-section of the base and its projections, whereby when the base is inserted into the bore, a tight interference fit is developed between the sides of the base and the bore and the projections and slots, whereby depending on the orientation of the base and the keyway, the assemblies either engage or do not engage.

One advantage of this invention to provide polarizing members that may be inserted into a connector without the use of tools.

The invention thus provides a polarizing and guidance means which can be readily adjusted to provide a plurality of different polarizing positions.

There is also provided a pair of interchangeable polarizing insert members having a key and a keyway respectively and adapted for an interference fit within bores confrontably disposed within respective plug and receptacle assemblies of a connector body.

Another advantage of the invention is the provision of a programmable keying and guidance device capable of positioning of a connector body so that it will mate only with a predetermined member.

Still another advantage of this invention is to provide a connector polarization and guide pin that can be rapidly installed in a plurality of desired positions in a connector body.

A further advantage of this invention is the provision of a polarizing insert having radially extended portions non-rotatably interfitted within a slotted bore of an assembly to be polarized.

The invention will be more fully understood from the following description when the same is read in connection with the accompanying drawings.

Figure 1 is a fragmentary view in perspective of a separable electrical connector with plug and receptacle assemblies thereof aligned and mated;

5 Figure 2 is a side view of an adjustable polarizing pin in accordance with the invention;

Figure 3 is a top view of the polarizing pin of Figure 2;

Figure 4 is a top view of a multi-sided insert member;

10 Figure 5 is a side view of the multi-sided insert in section taken along line V-V of Figure 4; and

15 Figure 6 is an exploded perspective view of the polarizing pin, the multi-sided insert, and the plug and receptacles of the electrical connector properly oriented and in mateable relation.

In an electrical connector (100) having mateable plug (10) and receptacle (20) assemblies, connector polarizing means (30) are provided for controlling proper mating between the assemblies and making commonality of construction between connector assemblies possible, thereby permitting their economical production and stocking. In accordance with one aspect of the invention, the polarizing means (30) includes a polarizing pin (40) having a round multisided base (42) and a key (52) extending therefrom, a round multi-sided insert (60) having a base (62) with a keyway (72) disposed therein and a plurality of projections (50,70) extending radially outwardly from the sides of the bases (42, 62), each of the projections being longitudinally disposed between the respective top (43,63) and bottom portions (47, 67) and angularly spaced from each other around the sides thereof. The multi-sided bases (42, 60) are adapted to be received in seats or bores (14, 24) disposed in the assemblies (10,20) of the electrical connector when brought into aligned confronting relation, the bores including a plurality of slots (16,26) radially extending outward therefrom. The slots (16,26) define registerable positions for the projections (50,70), the positions permitting the polarizing pin (40) and the keyway (72) to be programmed to be disposed in any one of a number of different angular interfitable positions. A cross-section of each respective bore and its associated slots is somewhat smaller than the cross-section of each base and its associated projections, thereby providing a tight interference fit therebetween. Further, each base is configured to be interchangeably fittable within either bore (14,24).

When the assemblies (10, 20) are properly aligned and when the polarizing means (30) is correctly oriented, the plug assembly (10) may engage with the receptacle assembly (20). Engagement is achieved when the key (52) interfits within the keyway (72). When the key and keyway are not correctly oriented relative to each other, mating of the connector assemblies is prevented.

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Figure 1 shows the assembled electrical connector (100), the assembled connector comprising the plug assembly (10) having a plug body (12) being mated with the receptacle assembly (20) having a receptacle body (22). The polarizing pin (40) is shown properly oriented and mounted in the bore (14) of the plug body (12). A plurality of (not shown) electrical contacts disposed in the plug body (12) interconnect with a plurality of (not shown) mateable contacts disposed in the receptacle body (22) when the two assemblies are fully mated.

The plug body (12) includes the inwardly extending bore or seat (14) for receiving the base (42) of polarizing pin (40), the bore (14) being axially aligned with and in confronting relation with the (not shown) keyway (72) disposed in the receptacle body (22). The bore (14) is generally round and includes the plurality of slots (16) extending radially outward from the bore, each slot being angularly spaced from the other there-around, the bore and its associated slots having a generally symmetrical cross-section. The slots (16) could be of any desired shape but are shown in Figure 1 as being generally semicircular. The bore and its associated slots generally extend perpendicularly inward from a top surface(18) of the plug body(12).

Figure 2 shows the polarizing pin (40) in accord with the present invention and comprises the multi-sided base (42) and the key (52), the key (52) being secured to the base at one end (53) and extending therefrom to a free distal end (55), the distal end being insertable within the keyway (72). The base (42) is round and includes the plurality of projections (50) which extend around the sides of the base in a spaced relation, each projection (50) being longitudinally disposed between a top (45) and a bottom (49) end surface of the base, the base (42) and associated projections (50) having a generally symmetrical transverse cross-section.

As shown best in Figure 3, the key (52) of polarizing pin has a transverse cross-section in the shape of a Y, each portion of

the Y being disposed angularly nonsymmetrically relative to the other.

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A transverse cross-section of the bore (14) and of the slots (16) associated therewith is somewhat smaller than the transverse cross-section of the base (42) and associated projections (50) of the polarizing pin (40), thereby providing a tight interference fit between the bore (14) and the sides of the base (42) and/or between the slots (16) and the projections (50). Each slot (16) defines a registerable position for one projection (50). The walls of the bore may or may not interferingly fit against the sides of the base (42) of the polarizing pin (40) depending on tightness of fitment desired.

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Figure 4 shows the multi-sided insert (60) and comprises the base (62) having a cross section similar to that shown in Figure 3 for base (42) of the polarizing pin (40). The insertable base portion (62) of insert (60) has a round transverse cross section, includes the plurality of projections (70) extending radially from the sides thereof and the Y-shaped keyway (72).

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As shown in Figure 5, keyway (72) extends from a top end surface (65) the base (62) and into the insert. The cross-section of the keyway conforms in shape to but is slightly greater in size than that of the key in order to permit a close clearance fitment between the two. When both the key and the keyway are in confronting relation, properly oriented and aligned along a common axis, the plug and receptacle assemblies can be mated.

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In Figure 6, the polarizing pin (40) is shown in alignment with the bore (14) of the plug assembly (10), the multi-sided insert (60) having the keyway (72) in alignment with the second bore (24) of the receptacle assembly (20), the two bores (14,24) being axially aligned and in confronting relation and the key (52) on the polarizing pin (40) properly oriented for fitment within the keyway (72) disposed in the base (62) of multi-sided insert (60).

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The receptacle body (22) includes the second bore (24) and the second slots (26) extending radially outwardly therefrom, the second bore (24) being generally round and adapted to receive the base (62) of the multisided insert (60), the second bore and its associated slots having a generally symmetrical transverse cross-section and extending generally perpendicularly inward from a top surface (28) of the receptacle body (22). The second slots (26) could be of any desired

shape and are shown in Figure 6 as being generally semicircular. A transverse cross-section of the second bore (24) and its associated slots (26) is somewhat smaller than the transverse cross-section of the base (62) of the multisided insert (60) and its radially extending projections (50), the reduced cross-section providing a tight interference fit between respective slots (26) and projections (70) and/or the insert base (62) and bore (24). Each of the second slots (26) define a registrable position for the second projections (70).

The transverse cross-section of the base (42) of the polarizing pin (40), shown best in Figures 3 and 6 could be the same as the transverse cross-section of base (62) of the multi-sided insert (60) shown best in Figures 3 and 6, thereby allowing interchangeability between the bases (42,62) and permitting the polarizing pin (40) and/or multi-sided insert (60) to be received by either the plug (10) and/or the receptacle assemblies (20), respectively.

Although the key and keyway are shown as being Y-shaped, the polarizing pin could be prismatic and uniformly symmetrical in cross-section between the top and the bottom surfaces, the key having the shape of the base from which it extends. The angular position of the respective projections and slots would be nonuniformly positioned angularly about the respective bores to provide the polarization, the difference in cross-section providing the interference fit.

The distal end (55) of the key (52) is chamfered (57) and provides a smooth guide to the key when entering the keyway. The insertable bottom portions (47,67) of the base (42) and the multi-sided insert (60) are similarly chamfered.

Although six projections and six registrable slot positions are shown, thereby providing 36 positions with two polarizing means mounted at the respective ends of a connector assembly, the number could increase (decrease) depending on the number of positions desired. Further, depending on the compression or wedge-like fitment desired of the polarizing means, the projections and slot need not be semicircular but could be rectangular, triangular, or some other shape.

## C L A I M S

1. Polarizing means for mateable units such as electrical connectors (100) of the type having first (10) and second (20) engageable assemblies carrying mateable electrical contacts comprising a round bore (14) disposed in the first assembly (10) a polarizing key (52) removably mounted in the first assembly and a keyway (72) disposed in the second assembly (20), the key (52) and the keyway (72) having opposite ends with one end (55) of the key (52) being interfitable within the keyway (72) when properly oriented and in confronting relation on a common axis, an adjustable multi-sided base (42) having top (43) and bottom (47) portions and a generally symmetrical transverse cross-section, said base (42) extending from the other end (53) of the key (52) and adapted to be mounted in the first assembly bore (14) characterized in that the polarizing means further comprises a plurality of projections (50) extending outwardly from the sides of the base, each projection (50) being longitudinally disposed between the top and bottom portions (43,47) of and spaced from each other around the sides of the base, said bore (14) in the first assembly (10) including a plurality of slots (16) extending outwardly therefrom and defining registrable positions for receiving the projections (50), a transverse cross-section of the bore (14) and its slots (16) corresponding to but being somewhat smaller than the transverse cross-section of the base (42) and its projections (50), whereby when the base is inserted into the bore, a tight interference fit is developed between the sides of the base and the bore and the projections and slots, whereby depending on the orientation of the base (42) and the keyway (72), the assemblies either engage or do not engage.

2. Polarizing means according to Claim 1, characterized in that each pair of adjacent sides defining the multi-sided base (42) have a common longitudinal edge, one projection (50) being disposed along each of said common longitudinal edges.

3. Polarizing means according to Claim 1 wherein the second assembly (20) is provided with a second round bore (24) an adjustable multi-sided insert (60) having top (65) and bottom (69) surfaces and a generally symmetrical transverse cross-section, the keyway (72) extending into the insert (60) from the top surface (65), the insert being adapted to be removably mounted in the second

bore (24), characterized in that a second plurality of projections (70) extends outwardly from the sides of the insert (60), each of said second projections (70) being longitudinally disposed between the top and bottom surfaces (65,69) of and spaced from each other around the sides of the insert, and in that the second bore (24) in the second assembly (20) includes a plurality of second slots (26) extending outwardly therefrom and defining registerable positions for receiving said second projections (70) a transverse cross-section of the second bore (24) and its slots (26) corresponding to but being somewhat smaller than the transverse cross-section of the insert (60) and its projections (70), whereby when the insert (60) is inserted into the second bore (24), a tight interference fit is developed between the sides of the insert (60) and the second bore (24) and second projections (70) and respective second slots (26).

15 4. Polarizing means according to Claim 3 characterized in that the transverse cross-section of the base (42) and the insert (60) and of their associated projections (50,70) correspond in size and location, thereby allowing the base or the insert to be inserted in either the first and/or second assembly respectively.

20 5. Polarizing means according to any of the preceding claims characterized in that the key (52) and associated keyway (72) are Y-shaped.

25 6. Polarizing means according to any of the preceding claims characterized in that the one end (55) of the key (52) and the end of each projection (50,70) disposed adjacent the bottom of the base and the insert respectively is chamfered, thereby facilitating entry thereof into the keyway or into the slots (16,26) of the respective bores (14,24).

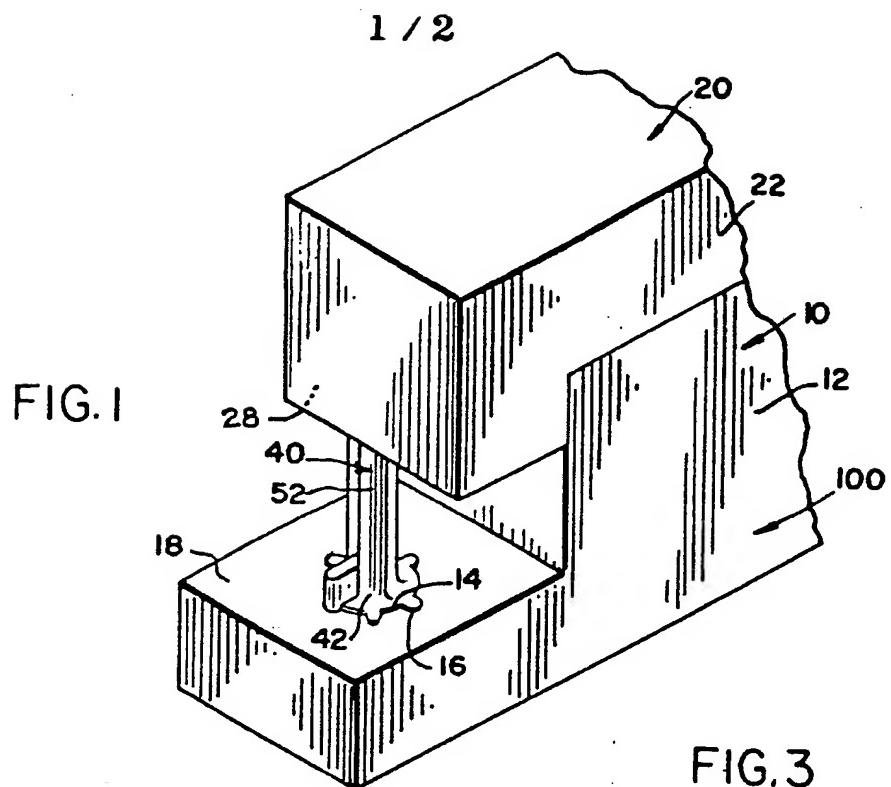


FIG. 4

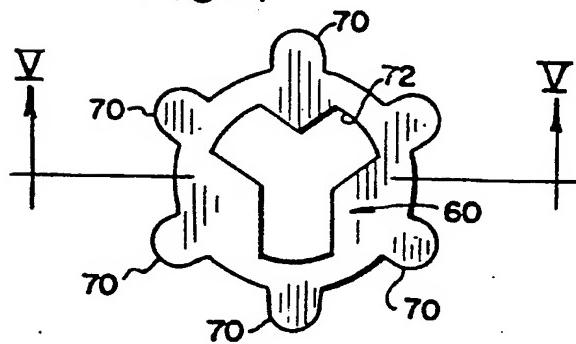


FIG. 5

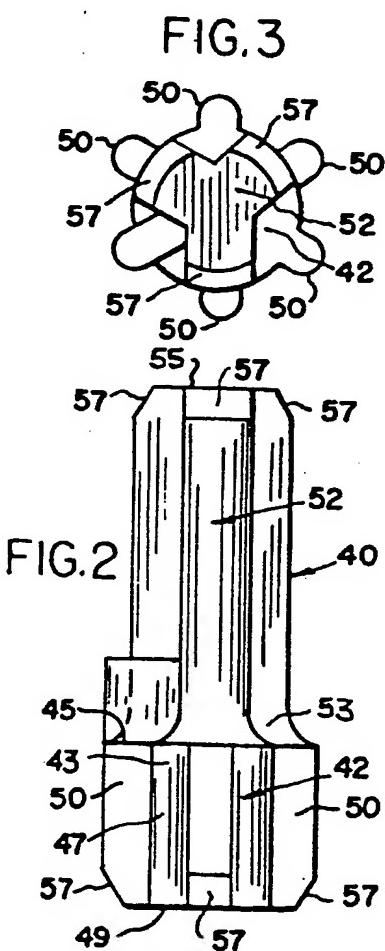
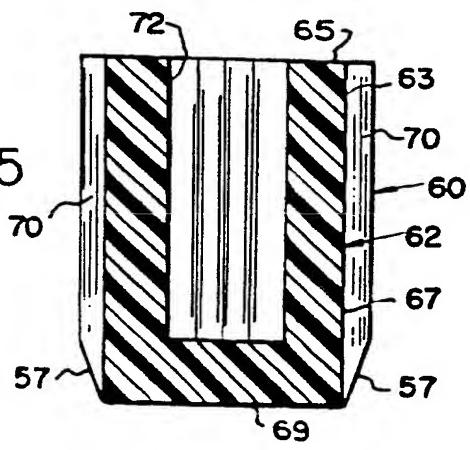


FIG. 3

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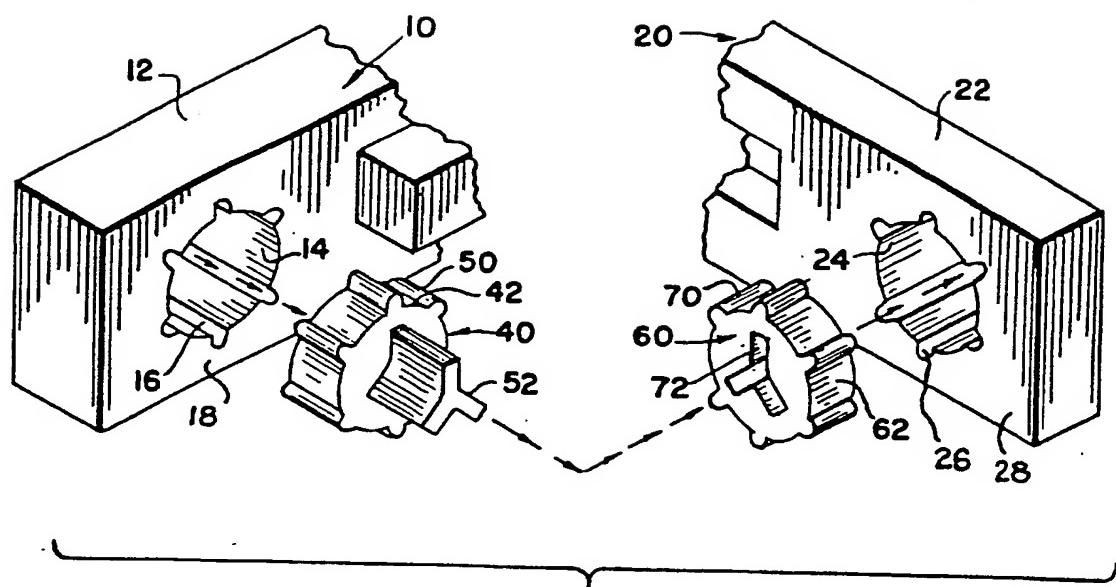


FIG. 6